

‘How do trainee teachers perceive the QTS numeracy test?’

An examination of the perceptions of the numeracy test required for the conferral of Qualified Teacher Status from trainee teachers.

Jane Kay

Jane Kay - I am a fellow of the IfL and have gained QTLS status, have completed an MA and am now working on a PHD by research, due to be completed in 2015. I have worked as head of maths and programme leader for 19+ basic skills at Accrington College, Assistance Curriculum Manager for GCSE maths at Bury College and will be moving to the Bolton Wanderers Free School this year to head up Maths and English for their first cohort of students. I have published online resources for functional skills mathematics at three levels and am currently working on more texts for learning in GCSE and functional skills mathematics. I am passionate about the positive impact of developing numeracy skills for individuals, and the need for this kind of learning even at the post-graduate level.

Abstract

The compulsory UK education sector (primary and secondary) or schools sector requires trainee teachers to complete a numeracy skills test in addition to holding a GCSE in mathematics at a minimum grade C. This article centres on the perception of the QTS numeracy test from the standpoint of those who undertake to be tested. Anecdotal evidence suggests that numeracy within teacher education programs is not favourably received or welcomed by trainee teachers. The research reported here primarily investigates the opinion and perception of numeracy tests presenting data collected from educational forums. These forums are online, open to public scrutiny and allow comments to be collected and analysed without the requirement for researcher participation. The researcher does not need to elicit responses and has no control over the comments produced, allowing for naturalistic data to be presented. The forum postings are treated as conversations or elements of conversational comment. Although analysis of conversation can also examine other elements, emphasis, for instance or body language, this is for the most part absent from forum postings. Trainee teachers have presented perceptions which are made up of different proximal and situational as well as personal factors. As trainees they must be supported to address their own level and depth of numerical comprehension whilst also examining the factors that surround the acquisition of this knowledge for their own students in the classroom to be successful as educators.

Key words

Numeracy, Mathematics, ITT (Initial Teacher Education), QTS (Qualified Teacher Status), Perception, Trainee teacher

Introduction and outline

The compulsory schools sector (primary and secondary schools) in the UK requires specific qualifications of trainee teachers on entry to training courses. These entry qualifications include a minimum of a GCSE grade C in mathematics. In addition to these requirements trainee teachers are expected to complete qualified teacher status (QTS) which includes compulsory skills tests in literacy and numeracy. The numeracy test can be the subject of much angst amid trainees, providing something like the same level of stress as a driving test.

Mathematics is a specific skill which has been in short supply, leading to criticisms that teachers are not sufficiently numerate or qualified to be able to support their learners (Hudson, 2006). The numeracy test has had very bad press in the past. An article in the Guardian newspaper (2010) revealed that: 'The majority of primary school staff cannot answer simple arithmetic questions'. Frankel, Morison and Sheil (2009) writing for the Times Educational Supplement (TES) on QTS numeracy tests, proffered the message that although trainee teachers found it difficult to pass the numeracy test, it provided evidence of skills that would 'come in handy' during a professional career in teaching and that the test was a necessary hurdle. Here we are asking: is the 'bad press' justified? What do the people who have to actually take the numeracy test, think about it?

The 2014 Secretary of State for Education (Michael Gove) outlined plans to reform teacher education, currently being implemented, including changes to the QTS tests to redevelop the tests themselves and make them act as entrance tests for the profession. This goes hand in hand with a review in curriculum for those aged 14 – 16 and new further education and training standards published by the Education and Training Foundation (ETF) (2014) which place an emphasis on supporting mathematical and English skills in the classroom.

The research

People's opinions and attitudes are difficult to classify as a quantifiable element, in the sense that if we want results that are meaningful to people, or from people, we must break down what it is that people do and examine the elements that relate to them and their practices. The probable extent to which knowledge that can be applied in practice derived from traditional research would be useful in a situation where people and their actions, practices opinions or values are important, is an issue (Markless, 2003). The opinions of trainee teachers on the numeracy test are likely to be more clearly audible and meaningful in their representation if they are collected directly and maintained as qualitative data.

Here, data is presented in its original format which a wholly quantitative study may miss altogether, or not take into account. Although a strong indication, numbers alone may not tell us the whole story in primary research (Dey, 1998) and are criticised for their tendency to ignore from the outset questions that do not necessarily benefit from a scientific style of enquiry (Charmaz, 2006).

To ascertain the opinions and feelings about the numeracy QTS test of trainee teachers and capture their voices in their own words, without constriction or any sense of reactivity (the process that occurs when subjects respond to the presence of an observer or researcher) (Berg, 2001) the conversation of trainees has been captured from online education forums. Their postings form a type of online narrative that indicates elements of their experiences and opinions of the QTS numeracy test.

This method allows unquantifiable facts about real people to be collected and observed through traces of conversation that they leave behind them and in doing so, let us share in the understandings and perceptions of others, allowing us as researchers to: 'obtain a better, more substantive picture of reality' (Berg, 2001) attempting to define a situation 'as it is' (McNiff and Whitehead, 2005).

Flick (2009) argues that internet examination of discussion provides a greater amount of anonymity for individuals who may become 'participants' in research via the use of avatars as identifiers. This utilisation of

online 'postings' is gaining momentum as a method of enquiry. The Times Educational Supplement, for example now has a regular report in its hard copy, dedicated to publishing opinions gathered via the online TES forums (Shaw, 2010).

Words are seen as the most common form of qualitative data (Robson (2002) which here are examined in an electronic form. These 'electronic conversations' represent a form of 'trace measure' or: 'the physical effects of interaction that remain after that interaction.' Robson (2002) trace elements are also known as 'accretion measures' or the evidence of the usage of something being a popular way of measurement, so in this instance, these unobtrusive observable indicators allow us to investigate information that may not be wholly accessible through other means: 'through traces people either intentionally or inadvertently leave behind' (Berg, (2001).

Studying elements like speech or conversation strings in forums that have already been produced, avoids the desire of individuals to present themselves in a socially acceptable light, or to respond to what they think a researcher wants, leading to data which is naturalistic, unobtrusively obtained and self – disclosing (Lee, 2000) this eliminates volunteer characteristics from participants, documented by Parker (2006) who investigated the phenomenon that those who volunteer have certain characteristics which will skew any data collected from the outset. It should be noted however that those who participate in online forum debate may also exhibit certain types of characteristic.

One of the advantages of employing this method is that no interaction has to take place between the researcher and those participating in online forums, for the researcher does not have to be present, or be part of the virtual group to observe any phenomena (Flick, 2009) (Lee, 2000) thus leading to greater spontaneity. This also has the advantage of providing data that although self-disclosing in nature, is not subject to bias in the population studied through the desire to give favourable responses (Lee, 2000) and has the advantage of providing data which doesn't necessarily contain non-verbal semiotics or paralinguistic elements of communication, 'body language' for instance, which is difficult to translate accurately in context (Flick, 2009).

The forum data was processed initially to remove individual names or avatars and any details that didn't form part of the conversational text. The data must be prepared beforehand, which means removing all the date and time information and individual posters details, turning the text into a continuous dialogue.

This collation of the comments allows for a fuller context to be taken into consideration, forming a type of cognitive anthropology, (Silverman, 2004) taking account of the way that people communicate fully or the fuller context of language, rather than simply taking incoherent parts of conversational text and drawing inference from them. Taking account of this fuller context of language used in the data is 'crucial' to understanding (Wodak & Meyer 2009). Using information which may not necessarily be the product of objective and reasoned thought, but is based more on opinion, emotion or belief (for example from internet forums) is clearly subjective in nature (Pears and Shields, 2009) and this must be taken into account from the outset.

How trainee teachers feel about the tests

The consensus observed: is that numeracy is an unpopular subject and is enough to make some trainee teachers believe that they are taking the wrong course. It evokes the same fears as school mathematics and for those who have been unsuccessful in this subject already, there is no desire to repeat this failure again especially with so much at stake (future career) at this high level and in front of their peers. In this respect, trainee teachers are similar in their attitude and approach to the subject as more traditional adult mathematics and numeracy learners.

Mathematics, (especially at any 'higher' level) is associated with occupations that require lengthy study and higher levels of cognitive development, for example doctors, chemists, engineers and anything related to science requires a higher level of mathematics qualification. Evidence for the perception of difficulty in this subject is provided by the fact that mathematics provision has declined at a higher level (level 3 or 'A' level).

Higher mathematics has become an unpopular study choice generally, even though the deferred reward for studying the subject is likely to be high. Trainee teachers are not a breed apart from other human beings. These individuals are likely to suffer proportionately within the population from the same anxieties and struggle with the same difficulties in numeracy or mathematics as any other adult learner. These fears stem from the perceived difficulty of the subject and the lack of understanding as to why this subject has reared its head again at this later point in life .

- 'I think i will be a great teacher but think i may fail my course because I can't pass the English and Maths tests'
- 'I don;t understand why all teachers are supposed to be fast in numbers'
- 'Hi i'm doing secondary french and german and i still cannot understand the mental arithmetic section is of use to me i already have a GCSE in Maths which was a requirement of the course and i wont have to work out any of the questions in my head that are on the test. So i wont be getting year 6's asking me any maths questions thank god.'
- 'I really would hate to think that I could not become a teacher in a subject that hardly ever uses maths!'
- 'schools could lose out on perfectly good teachers (and I'm not meaning myself here, per se) because they struggle with numbers.'
- 'why should you need to pass your Maths skills test when you're teaching English or Languages?'
- 'since I am training to teach Secondary English, I really don't see what being able to do mental arithmetic in a timed situation has to do with my ability to teach my subject.'
- 'before mt PGCE i re-took my maths gcse 4 times before i passed. I have revised lots online but still havnt passed i re-took the test last week and failed by 1 mark!!'

(The comments above are trainee teachers, taken from conversation posting in online forums)

Many teachers have expressed that they do not feel wholly prepared to teach any kind of numeracy especially, since they feel that they themselves are lacking in mathematical attainment. This negative self-perception attributed to the self image of a teachers own ability in mathematics has an effect on the teachers entire emotional state and may then influence in turn the way that individuals perceive themselves (Jacoby, 1997). This negative influence on the ego for the teacher may lead to avoidance of numeracy or mathematics learning altogether.

When faced with mathematical or numerical instruction, a student has two choices, controlled by cognition and emotional response. They can either; 'control emotion and put effort into cognition' (described as a learning intention) 'or limit cognition and put effort into preventing "distortions of well-being"' (described as a coping intention) (Boekaerts, 1995). The theory of social cognition (Bandura, 1997) examines achievement (in terms of successful task completion) as being made up of several inter-related factors within the individual. These factors include elements of an individual's behaviour, environment and personality, controlling the emotional or cognitive response, which may not be an entirely conscious action on the part of the individual. Malmivuori (2000) stated that these factors created a 'filter' through which people create a 'self system'. This system is built up from new and past mathematical experiences (Hauk, 2005), exemplified by Swain et al (2005): 'Learning mathematics can change who people think they are, and in some cases, how they see the world'. For many learners this is true in a negative sense, their mathematics lessons have left them with a negative perception of their abilities that does not correspond with their actual ability.

The way that we learn mathematics, may be related to the feelings that are associated with mathematics (numeracy). At primary levels, methods for teaching mathematics are often hands on, practical, kinaesthetic and make full use of collaborative work or 'circle time' (Taylor 2003) and most pupils do not have the negative perception that will follow them later. In contrast, secondary methods are often characterised by 'chalk and talk' and textbook learning (Wadsworth, 1996) which provides a classroom experience that tends to be 'boring and uncritical' (Apple 2004).

- 'I was petrified about my numeracy test'
- 'Hi I have complete sympathy with anyone taking or struggling to pass the stupid numeracy QTS Test'

- 'for me the QTS numeracy was a horrible mixture of stress and boredom'
- 'I was very anxious because I have never considered maths to be my strong point.'
- 'The numeracy skills test is seriously upsetting me.'
- 'I'm also really really scared about the numeracy test'
- 'but the maths was horrendous!'
- 'Mental calculations can be quite difficult'
- 'I'm dreading Numeracy!'
- 'when it came to Num I was a nervous wreck,'
- 'really worried about numeracy.'

(The comments above are trainee teachers, taken from conversation posting in online forums)

Wadsworth (1996) saw students in mathematics as passive and as recipients of knowledge rather than active participants in learning, a common view held by students themselves in relation to mathematical or numerical subjects. Pupil attainment is still the main indicator of success or failure, hence 'passing the test' is still the most important feature of learning and instruction (Papen (2004). Again a negative view commonly ascribed to mathematics and numeracy, taking a mathematics test can lead to a huge amount of anxiety, which in small amounts is useful in a test situation, but for those who have failed several times previously in this subject, that anxiety is an expression of our knowledge of our own weaknesses and threatens the ego's autonomy for an individual (Jacoby, 1997).

Students often blame the teachers for their dislike of maths. Baker (2003) refers to the teaching of mathematics as '...boring and irrelevant'. There are many people who struggle, sometimes daily with even the simplest mathematical operations (including teachers) with more complex analysis or conceptual understanding evading many individuals for the whole of their lives (Parsons & Brynner, 2006). This universally perceived difficulty inherent within the subjects mathematics and numeracy, promotes the concept that it is almost socially acceptable to be bad at maths (Tout 2005). Although students may see themselves as being failures in mathematics, this perception is often unfounded. They have not been successful in the 'formalised' mathematics engaged in during school years. In reality, students may be proficient or functional; 'they may be doing mathematics with their hands and in their heads rather than on paper' (Coben, 2000). Crossing a road is an example of skills in practice that may not be as easy to get down on paper: here a person must judge speed and distance simultaneously in three different directions, those individuals who are still alive, are clearly effective in the application of practical numeracy.

Misinterpreting even a small piece of essential information can have detrimental effects for the learner, where a fear of failing and of being 'turned off' is present. Due to the nature of learning in mathematics being hierarchical, and requiring foundational concepts to be thoroughly embedded into the schemata before more advanced concepts can be engaged with effectively (Kahn & Kyle, 2002) missing the foundations, or fatal errors in their execution (for example errors in the computation of standard algorithms) leads to a compounding of errors in any further processes. Attempting to calculate a mean average when the ability to divide has not been thoroughly mastered, for instance, sets the learner up to fail. Processes that promote mathematical understanding for learners' must be preferable to processes that simply allow a person to pass a test. Where teacher intervention in the classroom is appropriate and relates to the student directly, rather than emphasising the need to complete the 'correct answer', learning outcomes can be 'crucially' positively affected (French, 2002). Being 'lost' in the subject and 'hating maths' can create a fear which adversely effects the ability to learn effectively, with a background fear ever present (Schloglmann, 2006) when the individual is clearly capable of addressing the mathematical problems presented:

- 'I have recently taken the numeracy skills test for the 7th time and FINALLY passed it!!!!'
- 'It took me many times to pass my numeracy test,'
- 'I finally passed after six tries.'
- 'I am really struggling with the Numeracy skills test, I have taken it 8 times now and stil not passed!'
- 'finally passed the bloody thing today i sat the numeracy skills test 4 times.'

- 'i can't pass this stupid numeracy test'
- 'I have had a number of attempts. Today I have passed my Numeracy Skills Test. It was my 18th attempt.'
- 'I am on my third attempt at the moment to pass the numeracy test,'
- 'I took a few times to pass my numeracy test'

(The comments above are from trainee teachers, contained in conversation posting in online forums).

Political influences

Evolution and implementation of numeracy in programmes of initial teacher education is directly related to social and economic policy developments. The 'Lisbon Agenda' (2000) defined plans to create a European Union with a strong and competitive economy. The pivotal aspect of the plans for the Euro-economy: the development of skills in the lifelong learning sector (DfES, 2005). Using an integrated approach to education through economic policy development, allows rationality in a political sense, to be applied to govern problematic aspects of social and economic existence (Rose 1992). The importance of central government (and so of policy) as opposed to local authority and individual teachers, was enshrined in England through the Education Reform Act (1988) ensuring universal notions of numerical learning through state control and prescription (Johnson et al, 2007).

It is possible that these elements are self-fulfilling rather than underpinned by an essential need. Concerned with the ideological and political functions of education within the restricted school environment, Apple (1990) pointed to the ideological function of education being circular and self-fulfilling or self-justifying, in terms of removing conflict. Pointing to the way science is taught as an example of a set of technical knowledge, divorced from true application. From this standpoint it would be possible to see that the overlaps in the requirements at different levels for numeracy teaching and learning simply justify the need for the teaching of the subject. Apple expressed the currently popular viewpoint that a 'normative' and 'legitimised' curriculum (Apple, 1990) adversely affects the development of creativity for instance. It is likely that Apple is able to argue from a position of someone who has an appropriately well-developed set of numeracy skills and therefore has the ability and the tools to develop creativity and more than adequate self-expression.

Creativity and the development of 'free thinking' are reliant in many instances on cognition and self-expression which requires the ability to manipulate abstract concepts. Without numeracy skills, trainee teachers are unable to develop realistic levels of cognition that would allow them to be creative, conflicting or free thinking, basic numeracy being the most important tool to develop cognition through the manipulation of abstraction. Tammet (2009) and Newby (2005) both provide support for this proposition by indicating people actually need these numerical, reasoning and communication skills to function effectively at all, especially in the 'modern' twenty first century environment.

- 'I think something seriously needs to be done about this test in particular because there must be others out there like me that just aren't mathematically minded but good teachers!'
- 'These tests are pointless. They should make them a lot longer and harder and carry individual marks so they actually mean something. Passing a numeracy test that a Year 7 could do doesn't exactly prove much.'
- 'If I was in any kind of position of power I'd abolish the tests, I think their pointless'

(The comments above are from trainee teachers, contained in conversation posting in online forums).

Conclusion

Mathematical skills in particular have a strong influence on the development of more generalised learning and higher cognition. Numerical learning provides the tools for analytical thought and can develop the ability to conceive quantitative descriptions of the world (RAND Mathematics study panel, 2003).

A teacher that has a fund of knowledge to draw upon is likely to be more successful than a teacher who does not. Teachers are human, and are subject to the same previous mathematics experiences or 'histories' as other adult learners. They too may have avoided maths at all costs, and so teaching elements which rely on mathematical concepts and methods of reasoning and logic or teaching maths and numeracy itself, may prove difficult for them without support. Despite many arguments to the contrary presented in teacher forums, most subject areas contain elements of embedded numeracy, including sequencing an essay or report for any subject with a beginning, middle and an end.

From the information presented here, the direct words of the trainees themselves indicate that the overall perception of the numeracy test for QTS is negative. It is interesting to note that the literacy level of the trainee teacher's comments is low – this may be due to a genuinely low level of literacy, poor ability in terms of self-expression (indicating lower levels of numeracy skills) or a change in the way people input information in an informal environment, like a forum.

References

- Apple M.W. (1990) *Ideology and curriculum second edition*. New York: Routledge.
- Apple M W (2004) '*Ideology and curriculum, third edition*'. London: Routledge Falmer, Taylor and Francis group.
- Baker (2003) *Numeracy and 'funds of knowledge'* [Online] Last accessed (10/07/2007) available at: <http://www.maths4life.org/article> (Article ID=875) pg. 2
- Berg B L. (2001) *Qualitative research methods for the social sciences fourth edition*. USA: Allyn & Bacon. London: Pearson.
- Bandura (1997) cited in Hauk (2005) Mathematical autobiography among college learners in the United States. *ALM International Journal, Volume 1 (1)*, pg. 36-56
- Boekaerts (1995 and 1997) Cited in Hauk (2005) Mathematical autobiography among college learners in the United States. *Adults learning mathematics journal*. Vol 1 (1) pg 37
- Charmaz K. (2006) *Constructing grounded theory, a practical guide through qualitative analysis*. London: Sage Publishing.
- Coben D. (2000) *Numeracy, mathematics and adult learning*. Contained in Gal (eds) (2000) *Adult numeracy development, theory, research, practice*. chapter 2. USA: Hampton Press.
- Cole P (2002) *The theory of knowledge*. London: Hodder and Staughton.
- Dey I. (1988). *Qualitative data analysis, a user friendly guide for social scientists*. London: Routledge.
- DFES (2005) *Getting on in business, getting on at work*. Skills whitepaper part 1 London:HMSO
- Education and Training Foundation (ETF) (2014) *Professional Standards for Teachers and Trainers*. ETF. 21/5/14
- Education Reform Act (1988). Contained in Tomlinson S. (2001). *Education in a post-welfare society*. Buckingham: Open University Press.
- Flick U. (2009) *An Introduction to Qualitative Research edition four*. London: Sage Publications
- Frankel H. Morrison N. and Sheil V. (2009) *Sum may find it hard*. UK: TES magazine issued 3/7/09 part of the Times Educational Supplement: pg. 34
- French (2002) Cited in Haggarty (eds) (2002) *Aspects of teaching secondary mathematics. Perspectives on practice*. London: Routledge Falmer press for the Open University.
- Gregory (eds) (1987) *The Oxford companion to the mind*. UK: Oxford University Press
- Hudson C. (2006) *The implications for post-16 numeracy and maths of the Smith and Tomlinson reports, the 14-19 white paper and the skills white paper - a policy discussion paper*. London: National research and development centre for adult literacy and numeracy, Institute of Education.
- Hauk (2005) '*Mathematical autobiography among college learners in the united states*'. *Adults learning mathematics, an international journal*. Vol 1 (1) Op cit pg67
- Jacoby M. (1997) *Shame and the origins of self esteem, a Jungian approach*. New York: Routledge.

Johnson M., Ellis N., Gotch A., Ryan A., Foster C., Gillespie and J. & Lowe M. (2007). *Subject to change - new thinking on the curriculum*. London: Association of Teachers and Lecturers.

Kahn and Kyle (2002) *Effective teaching and learning in mathematics and its applications*. London: Kogan Page.

Lee R.M. (2000) *Unobtrusive methods in social research*. Buckingham: Open University Press.

Lisbon agenda (2000). Contained in: ETUC (2006). *The European Unions Lisbon strategy* [Online] available @ <http://www.etuc.org/a/652> (Last accessed 12/02/09)

Malmivuori (2000) cited in Hauk (2005).pg 37. 'Mathematical autobiography among college learners in the United States.

Markless S. Lea J Heyes D. Armitage A. Lomas L. (2003) *Working in post compulsory education*. Berkshire: Open University press.

McNiff. J. & Whitehead. J (2005) *Action research for teachers, a practical guide*. Oxon: David Foulton publishers.

Parker I (2006) contained in: Banister Burman E. Parker I. Taylor M. Tindall C. (2006) *Qualitative methods in psychology, a research guide*. Berkshire: Open University Press. pg 1, 6, 13

Papen (2004) *Adult literacy as social practice* Oxon: Routledge.

Parsons S. & Bynner J. (2006) *New light on literacy and numeracy - summary report*. National research and development centre for adult literacy and numeracy. London. [online] last accessed 23/12/2006) available at: www.nrdc.org.uk

Pears R. & Sheilds D. (2009) *Cite Them Right: The Essential referencing guide*. Durham: Pear Tree Books.

Robson C. (2002) *Real world research, second edition*. Oxford: Blackwell publishing

Rose N. (1992) Contained in Heelas P. & Morris P. (Eds) (1992). *The values of the enterprise culture, the moral debate*. London: Routledge. P141.

Shaw M. (2010). "Meddling parents, bye bye becta and shrinking kids' *Times educational supplement*. London: TES magazine 4th June 2010.

Schloglmann W. (2006). 'Lifelong mathematics learning - a thread or an opportunity?' Contained in; Taylor (eds) (2006) *ALM International journal*, Volume 2 (1) pp6 - 17

Silverman D. (2004) *Interpreting qualitative data methods for analysing talk, text and interaction. Second edition*. London: Sage publications

Swain et al (2005) *Beyond the daily application; making numeracy teaching meaningful to adult learners* National research and development centre for adult literacy and numeracy. [online] available at: www.nrdc.org.uk last accessed 03/06/12. pg67

Tammet D. (2009) *Embracing the wide sky, a tour across the horizons of the mind*. New York: free press, Simon and Schuster inc. Pg 221 – 253

Taylor , R. (2003) *Going round in circles*. Using research in practice. National foundation for educational research. NFER News. Autumn/Winter 2003. Slough. UK. pg3

Telese (1998) Ernest Paul (1998) - *social constructivism as a philosophy of mathematics*. Review. Education review, Albany state university. New york press. USA [online] available at; <http://edrev.asu.edu/reviews/rev25.htm> last accessed 09/05/2010.

Tout (2005) cited in Herrington and Kendal et al (eds) (2005) 'Insights from research and practice - a handbook for adult literacy, numeracy and ESOL practitioners' NIACE . Leicester.

Wadsworth (1996) *Piaget's theory of cognitive and affective development; foundations of constructivism, fifth edition*. Longman. New York. USA.

Wodak R. & Meyer M. (eds) (2009) *Methods of critical discourse analysis*. London: Sage publications